

INFORMATION REQUIREMENTS FOR THE  
AIR FORCE INSTITUTE OF TECHNOLOGY  
UNDER A FEE-FOR-SERVICE  
CONCEPT

THESIS

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AFIT/GIR/SC/93D-3

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INFORMATION REQUIREMENTS FOR THE AIR FORCE INSTITUTE  
OF TECHNOLOGY UNDER A FEE-FOR-SERVICE CONCEPT

THESIS

Presented to the Faculty of the School of  
Logistics and Acquisition Management  
of the Air Force Institute of Technology  
Air University

In Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Information Resource Management

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December 1993

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## Preface

The purpose of this study was to build a business process model to support AFIT's business processes under a fee-for-service concept. Due to the scope of this project, only a process model at the most rudimentary level was developed. The AFIT Enterprise Model developed in this research is the first step in understanding AFIT's business processes, identifying and documenting its critical processes from a macro level. Although this first model was not developed to a level of sufficient detail to provide any immediate benefit, it provides the foundation for a fully developed business process model for AFIT.

In writing this thesis we have had a great deal of help. We are deeply indebted to our faculty advisors Major Steve Teal for his technical assistance and Lt Col Tom Huguley for his guidance. We also wish to thank Major Gordon Wishon our primary advisor. Additionally, our thanks are extended to AFIT's senior leadership and the other staff members who allowed us to take time from their busy schedules for the interviews. A special thanks also goes to Colonel Koz, without whose support this project would not have been possible. Finally, we would like to thank our spouses, Sandra and Alexis, for accepting the many hours we were unable to spend with them but wanted to.

Jerry A. Cole  
Patricia C. Cruz

## Table of Contents

	Page
Preface . . . . .	ii
List of Figures . . . . .	v
Abstract . . . . .	vi
I. Introduction . . . . .	1
General Issue . . . . .	1
Problem Statement . . . . .	5
Objectives . . . . .	5
Limitations . . . . .	5
Summary . . . . .	6
II. Literature Review . . . . .	7
Overview . . . . .	7
Background of BPI . . . . .	8
A New Strategy . . . . .	9
A DoD Perspective . . . . .	14
DoD Business Process Improvement Program (BPIP) . . . . .	14
Business Process Improvement Projects in DoD. . . . .	16
The DoD Enterprise Model . . . . .	16
The DoD Universities Information Management Business Process Improvement Project . . . . .	17
Summary . . . . .	19
III. Methodology . . . . .	21
Overview . . . . .	21
Data Collection Plan . . . . .	21
Overview of IDEF . . . . .	22
IDEF0 . . . . .	24
Layered Approach . . . . .	26
AS-IS vs. TO-BE Process Models . . . . .	27
Interpreting the IDEF0 Process Model . . . . .	27
Summary . . . . .	29
IV. Findings and Analysis. . . . .	30
Overview . . . . .	30
A Strategic View . . . . .	30
Faculty. . . . .	32
Students . . . . .	32
Support Staff and Facilities . . . . .	33
Funds . . . . .	33
Information Resources. . . . .	34

	Page
Market Products and Services . . . . .	34
Customer Responsiveness. . . . .	34
The Functional Team. . . . .	35
The AFIT Enterprise Model. . . . .	36
The Context Diagram . . . . .	38
The A0 Decomposition Diagram . . . . .	45
The A1 Decomposition Diagram . . . . .	48
The A2 Decomposition Diagram . . . . .	51
The A3 Decomposition Diagram . . . . .	54
Summary . . . . .	57
V. Conclusions and Recommendations . . . . .	59
Overview . . . . .	59
Preparing AFIT for Fee-for-Service . . . . .	59
Recommendations for Further Research. . . . .	61
A Complete AFIT AS-IS Model. . . . .	61
A Proof-of-Concept Model . . . . .	61
The DoD Universities Information Management BPI Project . . . . .	62
A Final Recommendation . . . . .	62
Summary. . . . .	63
Appendix A: IDEF Glossary . . . . .	64
Appendix B: Selected Diagrams from the DoD Enterprise Model . . . . .	68
Bibliography . . . . .	73
Vita . . . . .	76

### List of Figures

Figure	Page
3-1. ICOMs. . . . .	27
4-1. AFIT Strategic Goals . . . . .	32
4-2. AFIT Context Diagram . . . . .	40
4-3. AFIT A0 Decomposition Diagram. . . . .	46
4-4. AFIT A1 Decomposition Diagram. . . . .	49
4-5. AFIT A2 Decomposition Diagram. . . . .	52
4-6. AFIT A3 Decomposition Diagram. . . . .	55



Abstract

Due to the current shift in national defense strategy, the DoD is going to have to perform new roles and missions with major reductions in resources. One of the major initiatives committed to achieving savings is Corporate Information Management, a broad program designed to help the DoD operate more efficiently by application of successful private sector business practices and better application of information technology. To meet the challenge of operating in a business-like environment AFIT must be able to maximize its competitiveness to provide customers with the quality and types of services they desire. To accomplish this task, information technology can be of benefit in identifying exactly how AFIT's business processes can be improved and in assessing the impact of future DoD policy decisions on the Institute.

This study developed a top level business process model for AFIT's information requirements under a fee-for-service concept. Once a comprehensive business process model is completed for AFIT, it will provide a framework on which AFIT decision-makers can assess the impacts of changes in DoD and Air Force policy on the Institute. The model will also provide a foundation for the development of an integrated information system capable of meeting AFIT's future information requirements.

**INFORMATION REQUIREMENTS FOR THE AIR FORCE**  
**INSTITUTE OF TECHNOLOGY UNDER A**  
**FEE-FOR-SERVICE CONCEPT**

I. Introduction

General Issue

Due to the current shift in national defense strategy, the Department of Defense (DoD) is going to have to perform new roles and missions with major reductions in resources. Defense Management Review Decisions (DMRD) have identified specific reductions and outlined initiatives to be used in obtaining these reductions. One of the major initiatives committed to achieving these DMRD savings is Corporate Information Management (CIM), a broad program designed to help the DoD operate more efficiently by application of successful private sector business practices and "better application of information technology" (3:36).

A derivative of CIM is the DoD Business Process Improvement Program (BPIP), which was created "to encourage a consistent application of process improvement principles and techniques across its services and agencies" (4:5). Since most of the savings specified in the DMRDs will come from improvements in business methods and revisions in

policies, BPIP techniques will be beneficial in bringing about these savings (3:36).

Defense Management Report Decision 971, a derivative of the Goldwater-Nichols Department of Defense Reorganization Act of 1986, compels DoD toward a more business-like environment. One of the means of accomplishing this environment is the establishment of the Defense Business Operation Fund (DBOF), which will significantly change the way most DoD support activities will be funded in the future. One major change is the concept of support activities charging customers for the services the activity provides. This concept, known as fee-for-service, will directly impact the way the Air Force Institute of Technology (AFIT) does business.

Under a fee-for-service concept, AFIT will charge its customers for the services it provides. The collection of fees from these customers will become the method by which AFIT receives its operating funds. This method represents a major change from the current system in which funds are allocated through DoD and Air Force channels based on projected requirements (16:11). Under this concept, it is critical that AFIT's information systems be able to accurately assess the costs of providing services. Without this capability, AFIT could find itself severely underfunded if costs are understated or cannot be defended adequately.

The key to AFIT being able to identify these costs is an integrated information system that can bring together different types of costs. Unfortunately, AFIT's current systems are developed primarily as individual applications, with different types of data being maintained on different systems in different directorates (14:I-13/14).

This segmented development process is not unique to AFIT. Historically, most information systems were developed simply to automate business processes to speed them up. This "bottom-up" approach to information systems development was adequate as long as each application could remain independent. However, as the complexity of organizations grew, with a corresponding growth in the complexity of their information needs, interdependency between systems also grew (10:204). To integrate individual systems in such cases requires a redesign of the organization's information system using a "top-down" perspective. An analysis of the organization's strategic goals and underlying business processes is the first step in the redesign process (13:28).

Operating within a fee-for-service environment will present new challenges for AFIT managers. Which AFIT services will be purchased, and at what level, will be decided solely by AFIT's customers. The customers' decisions will be made on the basis of matching their total needs with their limited funding. This means that AFIT will be competing with other organizations for a share of the

customers' funds. To remain competitive, AFIT managers must ensure that the Institute is operating in the most efficient manner possible. If AFIT cannot provide its services at a level of quality and cost acceptable to customers, the customers will either look elsewhere for similar services, or decide to fund other requirements (25:10).

To improve the operation of any organization, a thorough analysis of its business processes is required. This analysis determines which processes add value to the services provided and which do not. A business process adds value if it is essential to maintain the quality of service the customer demands or if it is essential to the organization's operation. Processes which add no value should be eliminated to improve efficiency (26:22).

A business process model links the various processes (or activities) to their respective outputs. This model can help decision makers determine where to make changes to business processes to improve efficiency and productivity. Once a business process model is completed for AFIT, it will provide a framework on which AFIT decision-makers can assess the impacts of changes in DoD and Air Force policy on the Institute. The model will also provide a foundation for the development of an integrated information system capable of meeting AFIT's future information requirements.

### Problem Statement

The purpose of this study is to develop a process model for AFIT's information requirements under a fee-for-service concept.

### Objectives

The following steps are required to develop the process model:

1. Identify the services AFIT must provide to fulfill the objectives of the AFIT Strategic Plan.
2. Define the business processes required to provide these services.
3. Build a process model to support the business processes of AFIT.

### Limitations

At the time of this research, the AFIT Strategic Plan and DoD guidance on implementation of DBOF and fee-for-service were still pending. Based on current guidance, the researchers assumed AFIT would be included in the DBOF at some point even though education and training are not currently scheduled to become DBOF activities. Depending on the direction DoD takes on DBOF, some parts of the model may need to be adjusted to accommodate the updated guidance. However, regardless of whether AFIT falls under the DBOF umbrella or not, the overall analysis presented in this

study should still be applicable in improving the business processes of the Institute.

### Summary

Significant policy changes within DoD, combined with significant technological changes, are creating new operational and management challenges for AFIT. To meet the challenge of operating in a business-like environment, as mandated by DoD, AFIT must be able to maximize its competitiveness to provide customers with the quality and types of services they desire. To accomplish this task, information technology can be of benefit in identifying exactly how AFIT's business processes can be improved and in assessing the impact of future DoD policy decisions on the Institute.

The remainder of this study will introduce business process improvement, identify AFIT's major business processes and how they are interrelated, and present those processes and their relationships in a business process model.

## II. Literature Review

### Overview

The key to success in a competitive environment lies in how efficiently and effectively an organization uses its resources. Business process improvement (BPI) is the DoD approved methodology for improving its efficiency and effectiveness by fundamentally changing the business processes used to accomplish its mission objectives. This chapter reviews the literature on business process improvement, beginning with a background of BPI, followed by a discussion of BPI as a new strategy for improving efficiency. The chapter continues with a DoD perspective and concludes with a brief look at two ongoing DoD BPI initiatives, the DoD Enterprise Model and the DoD Universities Information Management Business Process Improvement Project, that may have an impact on the Air Force Institute of Technology.

A number of different terms are used throughout the literature that are synonymous with business process improvement, such as business process reengineering, business process redesign, and functional process improvement. For the purposes of consistency in this research effort, the authors have chosen to use the term "business process improvement", other than in direct quotes.



## Background of BPI

The Information Age is dramatically changing nearly every aspect of many organizations: how they are structured, how they are managed, and how they operate. The massive advances in technology that have taken place over the past two decades have rendered many manual, and even many automated, systems obsolete (15:xvii).

Automation became the panacea for diminishing productivity and rising costs in the 1970s and early 1980s. As computers became increasingly more powerful and more accessible, the private sector, as well as the public sector, began to invest heavily in automated systems. Managers became convinced that automating existing processes was clearly the way to increase productivity and reduce costs (2:41).

Only after these dividends failed to materialize did these managers begin to realize that automation was not, in and of itself, the answer to their productivity and cost problems. One such manager summed it up simply, stating:

We've learned that technology for technology's sake does not increase productivity or mission effectiveness.... If you start out with a mess and simply add technology, you end up with an automated mess. (2:41)

In the mid 1980s, managers also began to realize that in many cases they were automating tasks that may not have even needed to be done in the first place. Likewise, they spent a great deal of time solving problems that should have

never happened in the first place. As the renowned management expert Dr. W. Edward Deming pointed out, the majority of management inefficiencies and excessive costs can be traced to the processes themselves (12:vii).

What managers have learned from their experiences is that business processes which have not been modified to correspond with technological and organizational changes become barriers to efficiency. As the business environment changes, the processes that were initially designed to accomplish an objective often become the biggest obstacle to achieving that objective. During the past few years, the results of their realizations have been embodied in a concept known as "business process improvement" (11:104-105).

#### A New Strategy

Business process improvement is "a systematic methodology developed to help an organization make significant advances in the way its business processes operate" (12:20). It is a prevention-oriented approach to performance improvement that provides a formal method to identify the business processes that need to be eliminated and those that could be performed more efficiently. Its primary focus is on the integration and optimization of an organization's processes as a whole rather than optimizing

individual subprocesses within the organization, in order to eliminate waste and bureaucracy (12:24-25).

Business process improvement has three key features that set it apart from other, more traditional, performance improvement initiatives. First, it is not designed to simply improve an existing process, but also the way in which people think about the process and the output it produces. To do this requires "recognizing and breaking away from the outdated rules and fundamental assumptions that underlie operations" (11:107).

Business process improvement recognizes that for many organizations, the conventional work structures and procedures were designed for a totally different environment, one based on little or no advanced technology, a different level of education in the labor force, and a set of management goals and objectives which have long since been replaced, probably more than once. Some processes were never designed at all. They were simply improvised at some point in time to meet a specific need under a specific set of circumstances, and they outlasted the circumstances for which they were created. As one author illustrates:

We have institutionalized the ad hoc and enshrined the temporary. Why do we send foreign accounts to the corner desk? Because 20 years ago, Mary spoke French and Mary had the corner desk. Today Mary is gone, and we no longer do business in France, but we still send foreign accounts to the corner desk. Why does an electronics company spend \$10 million a year to manage a field inventory worth \$20 million? Once upon a time, the inventory was worth \$200 million, and managing it

cost \$5 million. Since then, warehousing costs have escalated, components have become less expensive, and better forecasting techniques have minimized units in inventory. But the inventory procedures, alas, are the same as always. (11:110)

The second key feature of business process improvement is that, unlike other initiatives, it does not focus on a single process within a single functional area. It seeks to improve an entire process, from start to finish, regardless of how many functional areas of the organization may be involved. This is because it has been proven that when parts of a process are optimized individually, the operation of the organization as a whole may not be, which is illustrated by the following example provided by Dr. H.J. Harrington (12:13).

As part of a productivity improvement initiative, the order entry department of an organization decided to streamline its procedures by eliminating a step involving the verification of an item order number to its written description. The department's management justified this decision based on several factors: the number of errors found was very small (3%), the number of manhours spent on this task could be better utilized on other tasks, and the accuracy of the data on the order form was not the order entry department's responsibility but the salesperson who entered the data. After implementing the new policy, the department did indeed show a remarkable increase in productivity, to the delight of the company's senior

management. Unfortunately, it was only a matter of time before the company's customers started receiving errors in their orders, with corresponding negative results for the company, far outweighing the savings in the entry order department (12:14).

This example serves to illustrate the impact of optimizing an individual process (a functional perspective) rather than the entire process (a cross-functional perspective). From the entry order department's perspective, the process began when it received the order form from the salesperson and ended when it sent the order to shipping. However, from the company's perspective, the process began with the initial contact with the customer and ended with the customer's receipt of, and payment for, the merchandise ordered (12:15).

Many good managers conscientiously attempt to manage their own portion of a process, never even realizing that it is only a portion and not the entire process. This is due in large part to the organizational structure itself: no single individual is given overall responsibility for the entire process. BPI recognizes this difference in perspective and accounts for it by approaching process improvement from the broad perspective, working from the top down rather than the bottom up as other productivity initiatives do. It requires that a process owner be

identified and held accountable for integrating the parts of the whole process (12:15).

The third key feature of BPI is that it is not simply a fix and forget program. It incorporates the concept of continuous improvement as just as critical an element of the overall strategy as the other two features in today's dynamic environment. Dr. Harrington summarizes the reasons for this portion of the strategy in this way:

- New methods, programs, and equipment are coming out everyday.
- The business environment continues to change, making efficient processes obsolete overnight.
- Consumer and customer expectations change almost daily, making what was outstanding yesterday just meet requirements today and inadequate tomorrow.
- The people within the process develop increased capabilities, providing increased opportunities for process refinement.
- Uncared-for, unattended processes degrade over time.
- No matter how good the process is today, there's always a better way. All you need to do is find it. (12:247)

BPI is a tried and true method in the private sector for improving business performance and competitive advantage. As the Department of Defense begins to shift its business practices toward those used successfully in the private sector, it is not surprising that business process improvement is among them.

### A DoD Perspective

The DoD Reorganization Act and subsequent Defense Management Review Decisions set in motion several initiatives to achieve unprecedented levels of productivity increases and cost reductions within DoD. The magnitude of these requirements necessitates bold new strategies to meet these DoD goals. CIM is one of these initiatives, established to "improve military management techniques through better application of information technology" (3:36).

CIM is designed to eliminate inefficiencies and poor business practices by identifying redundancy and duplication of effort in DoD's business practices. By implementing business practices borrowed from the private sector, CIM represents a significant departure from the old way of conducting business within DoD. According to one estimate, CIM is expected to generate \$35 billion in savings by fiscal year 1997, most of which will be effected by better management techniques, which includes business processes (3:36).

DoD Business Process Improvement Program (BPIP). The Business Process Improvement Program was established by DoD to implement the CIM initiative and to provide for a consistent application of process improvement techniques across all DoD agencies. The BPIP incorporates specific modeling, costing, and analysis techniques such as the

Integrated Computer-Aided Manufacturing Definition Language (IDEF), Activity Based Costing (ABC), and Functional Economic Analysis (FEA), respectively (4:5-6). IDEF is discussed in depth in Chapter III.

Activity Based Costing was selected by DoD as the technique to be used for evaluating the costs associated with a business process. ABC simply provides a means of measuring the performance of a process. Using IDEF-driven models, DoD functional managers can use ABC information to compare the cost of what they are doing (the process itself) with what they are achieving with the process (the output). By matching cost with output, managers can easily target areas where improvement and management attention is needed (4:11-12).

Functional Economic Analysis is the DoD approved technique for weighing the risks and benefits of a proposed alternative to an existing business process. By using the performance measures provided by ABC, risk factors, and expected benefits as inputs, FEA provides DoD functional managers with a decision-making tool that incorporates all aspects of a given alternative as well as a method of tracking the savings associated with their decisions (4:13).

DoD's purpose in mandating these structured methods and specific techniques to be used in its business process improvement program is simple: integration. In an organization of DoD's size and complexity, its objectives of



eliminating waste and redundancy can only be achieved through its ability to integrate its various systems and components. Without integration, stovepipe systems will continue to maintain duplicate information, possibly defined in different ways, for the system's users. By having the information defined in a standardized way accessible to all users who need it, an integrated information system eliminates this duplication of effort. This objective is fully supported by the business process improvement methodology and its cross-functional perspective discussed earlier (4:6-7).

#### Business Process Improvement Projects in DoD

Two major DoD efforts applying BPI methods were found in the literature, both of which have the potential of impacting on BPI efforts at AFIT: the DoD Enterprise Model and the DoD Universities Information Management Business Process Improvement Project.

The DoD Enterprise Model. In support of DoD Directives 8000.1, Defense Information Management Program, and 8020.1-M (Draft), Functional Process Improvement (Functional Management Process for Implementing the Information Management Program for the Department of Defense), the Office of the Director of Defense Information established Project ENTERPRISE to build a process model for DoD starting with the highest level of the organization. At the time of

this writing, the model consists of the first three levels of business processes in the Department of Defense (5:i).

The significance of the model is that it provides the basis for "defining, coordinating, and integrating DoD missions .... and functional process improvement initiatives within and across functional and organizational boundaries" (5:1). Prior to using the top down approach of BPI, DoD's ability to integrate functions and systems was hindered by processes that were inflexible, costly, and simply not compatible, i.e. lacking interoperability (5:3).

The DoD Enterprise Model provides a framework upon which all DoD functions can begin to identify common processes and standard interfaces and to provide the context for modeling all organizations within DoD, including AFIT. According to DoD guidance, detailed process models, such as the one designed for AFIT in this research effort, should be aligned as closely as possible with the enterprise model. This will make it easier to integrate with the higher level models as they are built. However, the guidance also states that process improvement efforts should not be slowed down simply to accommodate the enterprise model (5:E-7).

The DoD Universities Information Management Business Process Improvement Project. Another major BPI project with potential application to AFIT is the DoD Universities Information Management Business Process Improvement Project. The project began in 1991 as a response to a GAO report that

identified major problems in the service academies' ability to compile and accurately track financial data. The Department of the Navy began exploring the feasibility of purchasing an off-the-shelf software package to be used as a standardized accounting system by the service academies (18).

The project was brought to the attention of the Office of the Director of Defense Information, and shortly thereafter a formal BPI project was initiated. A proof-of-concept pilot project was undertaken by the U.S. Military Academy at West Point focusing on the Academy's financial management business processes. Several improvement opportunities were identified, along with alternatives and recommendations, generating an estimated savings of \$1 million annually (8).

Included among the project's recommendations was the expansion of the financial management study to the other service academies. The project also recommended that comparable BPI projects be initiated for other major areas of the service academies' operations: registrar/admission system, alumni/development, service/facilities, and organizational/human resources. At the time of this writing, participation in the project was still limited to the service academies; however, support has been formally committed by several other DoD university senior leaders. These include the Presidents of the National Defense

University, Uniform Services University of the Health Sciences, and Naval Post Graduate School. The project also has Congressional support (8).

### Summary

The literature on the business process improvement approach to performance improvement clearly shows that BPI has the potential for bringing about the magnitude of change DoD is faced with achieving in the current environment. The savings required by the Congress due to DoD's downsizing cannot be achieved without fundamental changes to the current way DoD conducts its business. While other process improvement initiatives can effect incremental increases in productivity and cost reductions, BPI appears to be the only approach that can accomplish what DoD needs to do.

Because of its proven effectiveness in the private sector, DoD selected BPI as the catalyst for meeting the savings requirements of the CIM initiative. The DoD Enterprise Model and the DoD Universities Information Management BPI Project are two examples of DoD's commitment to this methodology.

With top level commitment to BPI, the seemingly unreachable DoD productivity and cost reduction goals may not be so unattainable after all. In line with the DoD goals, the Air Force Institute of Technology can also use

this approach to ensure its own business processes are committed to the same level of efficiency and effectiveness.

### III. Methodology

#### Overview

This chapter outlines the methodology used in fulfilling the three research objectives defined in Chapter I, beginning with a discussion of the data collection plan used by the researchers to collect the data needed to identify AFIT's products and services and their supporting business processes. The remainder of the chapter focuses on the methodology used to develop the process model.

First, it provides an overview of the family of IDEF modeling techniques currently being used or under development. The chapter continues with a detailed description of IDEF0, the specific modeling tool used by the researchers and concludes with an explanatory section on interpreting the IDEF0 process model.

#### Data Collection Plan

According to Emory and Cooper, there are two alternatives for collecting primary source data: observation and surveys (9:318). Of these two methods, the researchers concluded that the only viable one for this research was the survey since there is no practical means of identifying products and services and business processes by simply observing them, at least not at the macro level.

After reviewing Emory & Cooper's three types of survey methods (personal interviews, telephone interviews, and mail surveys) and comparing them with the research objectives, the personal interview was selected. This decision was made for two reasons: 1) a general knowledge of who the respondents would be was known initially based on the BPI approach to process improvement, and 2) the respondents were readily available (9:318).

Additionally, an unstructured format was selected for the interviews to allow for the widest possible range of responses and to minimize interviewer bias. The researchers were specifically interested in obtaining the interviewees' views with respect to answering the research objectives.

As stated earlier, the interviewees were selected using the BPI approach as outlined by Harrington (10:35). The list of the interviewees is included in Chapter IV.

#### Overview of IDEF

IDEF is a group of modeling techniques prescribed in DoD's Business Process Improvement Program as the mandatory methodology for modeling business processes within DoD. IDEF began in the mid-1970s as part of the Air Force's Integrated Computer-Aided Manufacturing (ICAM) program. ICAM was designed to improve manufacturing and engineering processes through the use of technology, a goal very similar

to DoD's Corporate Information Management program goal (7:59).

IDEF was developed to define the business processes and data needs of an organization. IDEF supports four areas in the business environment: "business process improvement, management of data as a resource, integration of information systems, and building of computer databases" (21:33). This research focuses on the business process improvement area.

As of late 1992, there were eight IDEF tools in use:

**IDEF0** captures functional requirements and is the most commonly used of the IDEF methods. It represents processes as a series of boxes connected by inputs and outputs. Unlike other data flow methods, it also captures the why and who through its control and mechanism notations.

**IDEF1** is an analysis tool that identifies the information in an enterprise, the rules governing its management, and the logical relationships among the information. It helps point you toward problems caused by inadequate information management.

**IDEF1X** is used to design relational data bases.

**IDEF2** defines a graphic simulation language for the translation of IDEF0 models into dynamic simulations.

**IDEF3** captures the behavior of objects in an enterprise through process flow descriptions and state transition diagrams.

**IDEF4** adds object-oriented data modeling for use in newer applications where relational technology may be insufficient to describe the data.

**IDEF5** supports a common framework for large projects by defining a repository of conceptual information to be used across functional boundaries.

**IDEF6** captures design intent, or the knowledge and thinking that went into framing the other models. (23:56)



There are another seven IDEF methods currently being developed:

**IDEF8** User Interface Modeling

**IDEF9** Scenario-driven IS Design

**IDEF10** Implementation Architecture Modeling

**IDEF11** Information Artifact Modeling

**IDEF12** Organization Modeling

**IDEF13** Three Schema Mapping Design

**IDEF14** Network Design (20:75)

This research effort concentrates on defining the fundamental processes at AFIT, therefore, only IDEF0 will be considered.

#### IDEF0

The IDEF0 modeling method is designed to model the activities of an organization. IDEF0 was derived from a well-established graphical language known as the Structured Analysis and Design Technique (SADT). The Air Force assigned the developers of SADT to develop a function modeling method for analyzing and communicating the functional perspective of a system (20:10).

Effective IDEF0 modeling advocates improved communication between the modeler and the customer. It also establishes the scope of analysis either for a particular functional analysis or for future analyses from another system perspective. As a communication tool, IDEF0 enhances

decision-making through simplified graphical devices. As an analysis tool, IDEF0 assists the modeler in identifying functions performed, what is needed to perform those functions, what the current system does correctly, and what the current system does incorrectly. Thus, IDEF0 models are often created as one of the first tasks of a system development effort (20:11).

To begin an IDEF0 modeling activity, the modeler must first determine what the purpose of the model is, from what viewpoint the activity descriptions will be formulated, and within what context. The purpose is a statement of the goals of the modeling activities. For example, one purpose of an IDEF0 functional analysis could be to identify opportunities for consolidating existing functions under a new CIM strategy. An accepted purpose provides the modeling team with a completion criterion. That is, when the purpose is accomplished, the model is finished (20:16).

The viewpoint statement describes the perspective that is taken when constructing, reviewing, or reading a model. This viewpoint establishes how the reader will interpret the model and how the modeler constrains his views of the activities. A viewpoint statement provides the modelers a mechanism for controlling the scope and level of detail in the model. The context establishes the interpretation and magnitude of the model as part of a larger scope. This

focus creates a boundary within the environment for the model (20:13).

Layered Approach. A major advantage of IDEF0 models is the hierarchical decomposition of activities. A box in an IDEF0 model represents the boundaries drawn around some activity. Looking inside that box leads one to discover the breakdown of that activity into smaller activities which together comprise the box at the higher level. This hierarchical structure helps the modeler keep the scope of the model within the boundaries represented by the activity's decomposition (20:17).

IDEF0 uses a layered approach beginning with the broadest activities, i.e., the critical processes, and adds greater detail at the lower levels. This hierarchical design affords a strategic as well as an operational view of the organization (4:3-5). The critical processes are analyzed in terms of four possible roles of information known collectively as ICOMs (Figure 3-1):

**Input**--information or material used to produce the output of an activity

**Control**--information or material that constrains an activity; controls regulate the transformation of inputs into outputs

**Output**--information or materials produced by or resulting from the activity

**Mechanism**--usually people, machines, or existing systems that perform or provide energy to an activity (4:66-67).

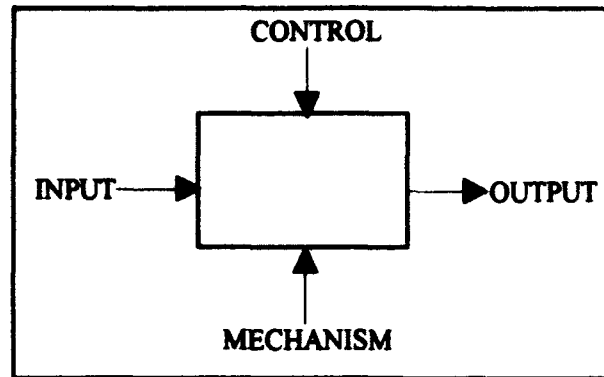


Figure 3-1 ICOMs

AS-IS vs. TO-BE Process Models. One important benefit of using IDEF0 process models is being able to use them to depict the difference between the way processes actually work (the AS-IS model) vs. the way they should or could work after improvements are made (the TO-BE model). Developing an AS-IS model to document the current processes allows the user to establish a baseline from which performance improvements can be measured. One author related the two models mathematically as "the AS-IS model plus improvement activities equals the TO-BE model" (4:73). This research is limited to the AS-IS model due to the scope of the effort.

#### Interpreting the IDEF0 Process Model

An IDEF0 process model begins at the highest level of the organization, providing an enterprise-wide view, then breaks down, or "decomposes", each process, adding more detail at each level of decomposition. Although there are different levels of detail, the method of interpreting any

IDEF0 diagram can be reduced to a single set of standard IDEF rules.

The text within a rectangular box represents the process being accomplished. The arrows going into the box from the left are the inputs to the process; to the right of the box are the outputs. At the top are the controls placed on the process, i.e. the parameters or constraints within which the process must operate. Finally, the mechanisms used to complete the process are shown going into the bottom of the box. These four essential components of IDEF0 diagrams: inputs, controls, outputs, and mechanisms, are known collectively as ICOMs (4:65-71).

The parentheses shown around some of the ICOMs denote that they will not be shown at the next level of decomposition, a technique known as tunneling. It is used to simplify a diagram when the ICOM applies to each process contained in the decomposition. Unless tunneled, each ICOM shown in an IDEF diagram must align with an ICOM in its decomposition diagram. For example, from an overall perspective, the AFIT A0 decomposition diagram in Figure 4-3 (the decomposition of the AFIT context diagram in Figure 4-2) must show three inputs, four outputs, and one control (the other two controls are tunneled) to match with the context diagram, which it does. Within a diagram, however, other ICOMs may be created for internal use.

### Summary

This chapter described the data collection plan selected by the researchers. Personal unstructured interviews were chosen based on the objectives and the sources of the needed data.

The chapter then introduced the IDEF methodology as the DoD prescribed business process modeling tool. It gave an overview of the current IDEF modeling techniques in use and a listing of the ones currently under development. Next, it discussed IDEF0 in detail, and concluded with a set of guidelines to assist the reader in interpreting the IDEF0 process model diagrams presented in Chapter IV.

## IV. Findings and Analysis

### Overview

As discussed in Chapter I, a business process model links business processes to their respective outputs which can be used to help an organization's decision makers determine where improvements in efficiency and effectiveness can be made. It also serves as a means for determining if existing business processes add value to the organization and whether they support the organization's goals.

This chapter presents the findings of the researchers with respect to the three objectives stated in Chapter I: 1) identify AFIT's products and services, 2) define the core business processes, and 3) build a process model. It begins with a strategic view of AFIT's critical success factors as seen by its senior management. Next, the chapter discusses the use of a functional team by the researchers to facilitate development of the model. The remainder of the chapter is devoted to the presentation of the process model developed in this research, the AFIT Enterprise Model, a macro level model consisting of a context diagram and two levels of decomposition.

### A Strategic View

As stated in Chapter III, the first step to analyzing business processes is to define the mission and examine its

strategic plan and underlying goals. According to its mission statement, the Air Force Institute of Technology exists to "support national defense through graduate and professional education and research programs" (1:2). To accomplish this mission, a strategic plan is developed, from which is derived the products and services AFIT will provide, along with the goals and objectives to support them.

Since the strategic goals originate at the strategic level, top level management, the researchers conducted personal interviews with eight members of the AFIT senior staff. The interviewees consisted of the Vice Commandant, Director of Academic Affairs, Senior Dean and Scientific Advisor, Dean of the School of Systems and Logistics, Dean of the Civilian Institution Programs, Associate Dean of the School of Logistics and Acquisition Management, Associate Dean of the School of Civil Engineering and Services, and the Assistant Dean of the School of Engineering.

The researchers interviewed each of these individuals using an unstructured format to obtain the widest range of views from the senior management level. Each interviewee was asked to provide his assessment of the critical success factors (CSFs) with respect to AFIT providing graduate education, PCE courses, research, and consultation which are Afit's current products and services. The researchers consolidated the results of the individual interviews into



seven critical success factors and matched them against AFIT's strategic goals, shown in Figure 4-1. Five of the seven CSFs corresponded directly to the six strategic goals. A brief summary of each CSF is provided following Figure 4-1.

- GOAL 1: Know our customers: be responsive to their needs, anticipate their requirements and exceed their expectations.
- GOAL 2: Recruit, develop, and retain a highly qualified faculty and staff.
- GOAL 3: Produce well educated, highly valued graduates motivated to meet the AF's challenges.
- GOAL 4: Create an environment to encourage excellence, innovation and teamwork.
- GOAL 5: Confirm to senior Air Force leadership and other customers the quality, cost effectiveness and responsiveness of AFIT.
- GOAL 6: Institutionalize a dynamic quality improvement process.

SOURCE: AFIT/CCP

Figure 4-1 AFIT Strategic Goals

Faculty. All of the interviewees agreed that the quality of AFIT's faculty, particularly the Institute's ability to recruit, develop, and retain a quality faculty is of paramount importance to AFIT's survival. Although there are a number of other factors that impact on how well it can accomplish these objectives, such as funding and facilities, the management of faculty is a critical success factor because it directly impacts on the quality of AFIT's products and services. Recognition of this importance is reflected in AFIT Goal No. 2.

Students. The students themselves are also a critical success factor for the Institute. The selection of high

quality students to attend both the graduate education programs and PCE courses has a direct impact on AFIT's ability to meet its goal of producing high quality graduates, AFIT Goal No. 3. Under a fee-for-service concept, the issue of AFIT graduate quality may become a major factor in a customer deciding if, or how much, he is willing to pay for an AFIT graduate. Therefore, the business processes associated with the management of students, from recruiting and selecting them to graduating them, is an area of primary importance to AFIT's leadership.

Support Staff and Facilities. A third critical success factor noted by the senior staff is AFIT's ability to provide quality support staff and facilities, as reflected in Goal No. 4. The quality of the working environment in which the students and faculty must operate and the quality of support they receive directly influence the quality of products and services the Institute provides its customers. Maintaining this support staff and facilities consumes a large portion of AFIT's operating funds and therefore warrants special consideration.

Funds. Although not directly reflected in an AFIT goal, the management of AFIT's funds are of sufficient impact on the Institute to be considered a critical success factor. The value added from the management of funds is its ability to determine the most efficient use of limited resources. AFIT has a number of various funding sources,

some of which have restrictions on the uses of the specific funds they provide. Without proper management of its funds, AFIT may not be able to defend its future funding requirements and could possibly even lose funding.

Information Resources. As with managing funds, the management of AFIT's extensive information resources, is also considered by AFIT's senior managers to be a critical success factor although not specifically addressed in an AFIT goal. AFIT's computer facilities, equipment, systems, and even its databases are critical assets that can be of immense value in optimizing efficiency in operations. They will become even more so under fee-for-service in which the ability to derive accurate cost data will directly impact AFIT's funding.

Market Products and Services. As reflected in AFIT Goal No. 4, AFIT's senior leadership recognizes the importance of ensuring that AFIT's customers understand its capabilities; i.e. what it can do for them and why they need its products and services. They also recognize the importance of convincing the customers that the quality of those products and services are of such a level that they are worth paying for under fee-for-service. To remain competitive, the Institute must have the appropriate business processes in place to accomplish these objectives.

Customer Responsiveness. The primary concern of AFIT's leadership, AFIT Goal No. 1, is the Institute's ability to

meet the needs and expectations of its customers. The flexibility to change in response to changing customer requirements is of critical importance to AFIT's survival under fee-for-service. The other six critical success factors all directly support meeting the customer requirements; this one goes one step further--being able to change to meet the customer requirements.

### The Functional Team

Once the products and services, goals, and critical success factors had been defined, the next objective was to determine the supporting business processes. Using the functional team approach outlined in Chapter III, the researchers selected the members of the team based on the recommendations of the senior staff members interviewed above. The functional team consisted of representatives from the Schools of Engineering, Logistics & Acquisition Management, Systems and Logistics, Civil Engineering and Services, a representative from the Civilian Institution Programs, and one from the Directorate of Admissions/Registrar.

Each member of the functional team was interviewed and asked to validate the researchers' conclusions drawn from the senior level interviews. They provided additional information on the requirements needed to support the critical success factors. This information was consolidated

and used by the researchers to develop the ICOMs associated with the macro level business processes depicted in the AFIT Model.

#### The AFIT Enterprise Model

The AFIT Enterprise Model developed in this research consists of a context diagram and four supporting decomposition diagrams, at two levels of detail. The model is aligned as closely as possible at the strategic level to the DoD Enterprise Model, discussed in Chapter II, to facilitate integration between the two models at some point. It is intentionally designed to mirror the DoD Enterprise Model to the extent possible for future integration purposes. The DoD Model diagrams comparable to the AFIT Model are included as Appendix B. As an enterprise model, one designed for the entire organization, the AFIT Model was developed from the viewpoint of the highest level of management, the Commandant.

In developing the processes and their associated ICOMs, the DoD Enterprise Model was used as the framework. The data obtained from the senior level and functional team interviews were then applied to this framework to tailor the model to reflect AFIT's critical business processes at the macro level. Unfortunately, the larger than expected scope of this research effort prevented the depth of development of detail the researchers had originally hoped for. This

model represents only the highest level business processes and will require further analysis and development before it can be used as a management tool.

Development of the model was accomplished in four steps, one for each level of detail and one to generate the computer model. However, each level required several iterations as relationships between processes were defined. First, the data collected during the two rounds of interviews were analyzed to determine a single, consolidated process that encompasses AFIT as a whole. This step answered the question of why AFIT exists (in relation to the DoD mission) and formed the basis for the context diagram, which provides a picture of an entire organization at its highest level of activity. This process was then analyzed in terms of its ICOMs to determine what is necessary to complete it and what the results of the completed process are.

The next two steps involve the decomposition, or breaking down, of this process and lower level processes into their respective component activities, providing more detail at each level. First, the context diagram was decomposed into its subprocesses. Relationships between the subprocesses were established and, as in the first step, each subprocess was analyzed in terms of its ICOMs. Next, these new processes were decomposed into their subprocesses, and the same analyses were performed. Finally, the results

of the above analyses were used to create the computer-generated diagrams, using an IDEF0 software package, Design IDEF, version 2.5.

The remainder of this chapter discusses each of the diagrams beginning with the context diagram. Although the logic for including many of the ICOMs may appear to be self-explanatory, a brief explanation of each is provided to facilitate the reader's overall understanding of the environment represented by each diagram. Interpretation of the graphic symbols and placement of the ICOMs is explained in Chapter III. ICOMs and processes are capitalized in the following presentation for ease in recognizing them as such.

The Context Diagram. The first (highest) level of an IDEF0 process model is the context diagram. This diagram contains little detail, but provides an overall view of the entire organization from a process perspective, a strategic view. It states in very simple terms the organization's reason for existence, what it needs to accomplish its mission, and what the organization produces, i.e. its products and services.

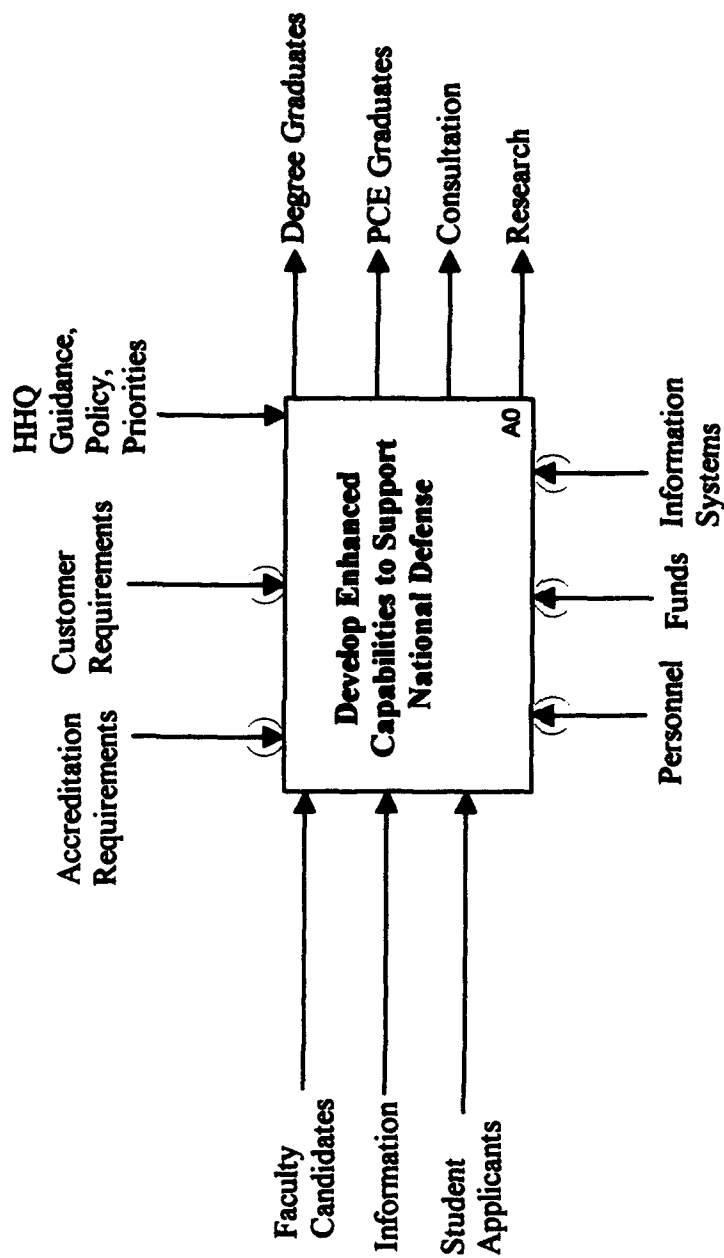
According to the AFIT mission statement, AFIT exists to "support national defense through graduate and professional education and research programs" (1:2). The DoD Enterprise Model defines the DoD mission as "provide for the common defense" (5:A-7). Taking AFIT's mission statement into the context of this DoD mission and its supporting business

processes, AFIT's role becomes one of developing enhanced capabilities to support national defense, as shown in the rectangular box of the context diagram, Figure 4-2.

In providing graduate and professional continuing education and research programs, the Air Force Institute of Technology plays a key role in supporting the DoD mission by developing critically needed skills and improving the capabilities of one of the DoD's most critical resources: its people. In addition to improving the capabilities of both students and faculty members, AFIT also provides direct benefits to the DoD through its extensive research and consulting efforts.

Placing AFIT's mission and its contributions into the context of a process model, this entire single process transforms the inputs of Faculty Candidates, Information, and Student Applicants into the outputs of Degree Graduates, PCE Graduates, Consultation, and Research. These three inputs represent the resources that, through completion of the process, become part of the output of the process; i.e. AFIT's products and services. For example, from a beginning to end perspective, Student Applicants become PCE or Degree Graduates through completion of the internal processes not shown in the context diagram. Similarly, Information about current areas of concern, the environment, technology, etc. often becomes a part of the Research and Consultation outputs.





Viewpoint: AFIT Commandant

NODE: A-0

TITLE: Develop Enhanced Capabilities to Support National Defense

Figure 4-2 AFIT Context Diagram

Finally, although Faculty Candidates do not become a part of any of the four final outputs, they are an output of one of the internal processes and become a mechanism to effect the transformation of the other two inputs into the final outputs.

The four outputs of the context diagram represent the products and services AFIT provides its customers and the contribution AFIT makes toward support of the DoD mission. A Degree Graduate is a former student who has completed a degree granting program and been awarded the degree by AFIT or by a civilian institution based on an AFIT sponsored program. A PCE Graduate is a former student who has completed at least one PCE course offered by, or on behalf of, AFIT. Research may be the result of a student's coursework, faculty members' efforts, or a combination of both. It may be in response to a customer request or internally generated and is more detailed, structured, and longer in duration. On the other hand, Consultation is usually short-term, problem oriented, and performed by faculty members at the request of an AFIT customer.

The outputs of this process are determined through the strategic planning processes of AFIT's senior leadership. In the context of developing the strategic plan and its supporting goals, these outputs represent what the decision makers have determined need to be the products that AFIT provides its customers. The actual process of determining

what these outputs are to be would be reflected in one of the internal processes of the AFIT Model. Specifically, it would probably be part of the Establish Direction process shown in Figure 4-3.

In completing this process, AFIT is constrained by three major controls: Accreditation Requirements, Customer Requirements, and Higher Headquarters Guidance, Policy, and Priorities. These controls represent the constraints AFIT's senior leadership must work within when establishing AFIT's strategic direction.

As a degree granting educational institution, obviously it is of vital importance to continue meeting Accreditation Requirements. Recognition of the prestige associated with an AFIT degree, both within DoD and in the civilian community, definitely adds value for the customers. From a fee-for-service perspective, failure to remain accredited would substantially detract from the value of the Degree Graduate output.

Meeting Customer Requirements is also a critical consideration for AFIT's success, particularly in a fee-for-service environment. The entire focus of fee-for-service is that it is customer-driven. If AFIT does not provide the products and services the customer needs and desires, the customer will not be willing to purchase what AFIT does provide. Therefore, subject to the Accreditation Requirements discussed above for AFIT's graduate education

programs, Customer Requirements is unequivocally the key constraint in the process of supporting national defense; the ultimate survival element for AFIT.

The last constraint, Higher Headquarters Guidance, Policy, and Priorities must also be addressed by AFIT's leadership. As with any DoD organization, there are a number of external constraints placed on AFIT by various higher headquarters. Not only must AFIT's senior leadership make strategic decisions within the constraints of Customer and Accreditation Requirements, they must also take into consideration the Guidance, Policies, and Priorities of Air University, Air Education and Training Command, Air Force, and the Department of Defense.

Finally, the mechanisms used to effect the transformation of the inputs to outputs are AFIT's personnel, funds, and its information systems. These mechanisms are also vital parts of the process without which the process could not be completed. As with many processes, people are the catalyst in making them happen. The Personnel mechanism consists of AFIT's faculty members and its staff, from senior management to the administrative and technical support staff.

Similarly, nothing is accomplished without the financial resources being made available to do so. Within AFIT, there are a number of funding sources, each with its own requirements and constraints, an entire topic of

discussion in itself. However, for the purpose of explaining its inclusion in the context diagram, Funds is one mechanism required for AFIT to accomplish its mission.

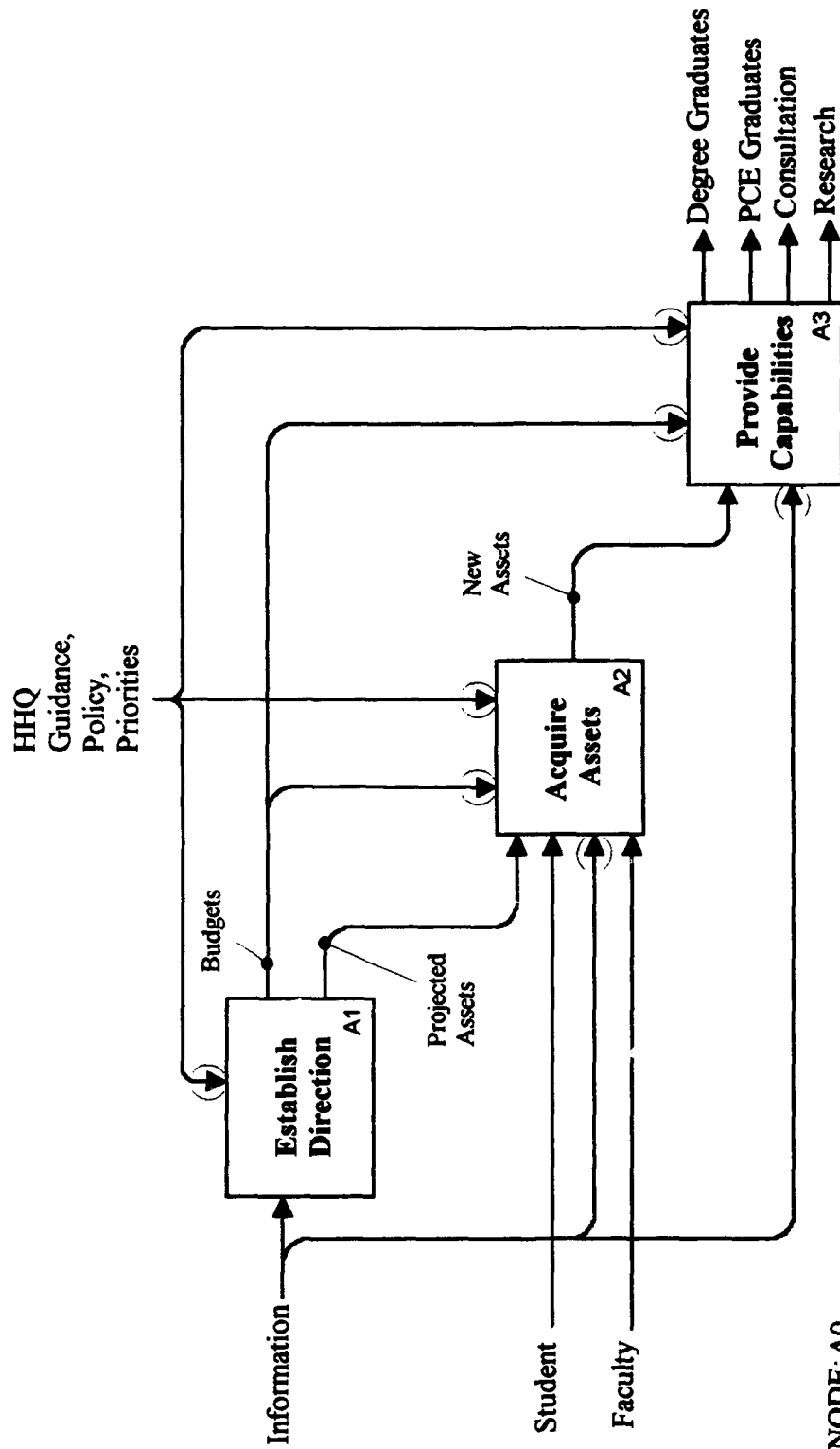
Information Systems, the final mechanism shown, includes all of the equipment, facilities, and supporting infrastructure necessary to manage the information needing to be produced, transferred, manipulated, etc. throughout AFIT's business processes. In the current environment of rapidly changing technology, Information Systems are becoming more and more critical to organizational effectiveness. As stated in Chapter I, this area must be given special consideration by senior leadership to ensure that other resources are being used in the most efficient manner possible.

This completes the presentation of the context diagram. Although it does not contain much detail, it does provide a wealth of macro level information about the Institute on a single page. It provides AFIT's senior leadership with a broad overview of the Institute at the highest level of business processes. By starting an enterprise process model at the top of the organization and working downward, decomposing this process into its lower level activities, integration of those processes is built into the model.

The remainder of this section presents the supporting diagrams of the AFIT Enterprise Model.

The A0 Decomposition Diagram. The A0 decomposition diagram in Figure 4-3 represents the decomposition of the process in the context diagram. It depicts how AFIT accomplishes the process of developing enhanced capabilities to support national defense. Shown in the rectangular boxes are the three major processes, as aligned with the DoD Enterprise Model, that AFIT must complete to accomplish its mission: Establish Direction, Acquire Assets, and Provide Capabilities. A fourth DoD process, Employ Forces, does not have an equivalent in the AFIT Model. Each of these processes has its own set of ICOMs and subprocesses, which will be further decomposed at the next level.

The Establish Direction process establishes AFIT's policies, determines requirements, and develops the plans needed to accomplish the mission. It encompasses AFIT's strategic planning and management activities. This process is subject to the same controls of Accreditation Requirements, Customer Requirements, and Higher Headquarters Guidance, Policy, and Priorities as the process from which it was decomposed. This process uses a single input, Information, described in the last section, to create the outputs called Projected Assets and Budgets. Projected Assets represent what type of assets and how much of each type of asset are required to meet AFIT's mission needs. This output then becomes an input to the next process. Budgets are the financial plans that determine the financial



NODE: A0

TITLE: Develop Enhanced Capabilities to Support National Defense

Figure 4-3 AFIT A0 Decomposition Diagram

resources needed to accomplish a specific purpose, including day-to-day activities and capital investments. They become controls for the next two processes. The Establish Direction process is decomposed in the A1 Decomposition Diagram, Figure 4-4, discussed later in the chapter.

The second process of the A0 Decomposition Diagram, Acquire Assets, includes the acquisition of assets necessary for AFIT to complete its mission: funds, students, faculty, staff, and physical assets such as buildings, equipment, and information systems. The process is constrained by the same controls as the previous processes, plus the additional constraint of the Budgets developed in the last process. Once these assets have been acquired, they become the inputs necessary for AFIT to provide its selected products and services. The activities composing the Acquire Asset process, shown in Figure 4-5, can be viewed as AFIT's tactical planning and management level.

The third process of this diagram, Provide Capabilities, transforms AFIT's assets into the four final output products identified in the context diagram. It is during this process that AFIT's day-to-day activities are accomplished such as training and educating students, conducting research, and performing consultation. These activities comprise the operational management level. The Provide Capabilities process is decomposed in the A3



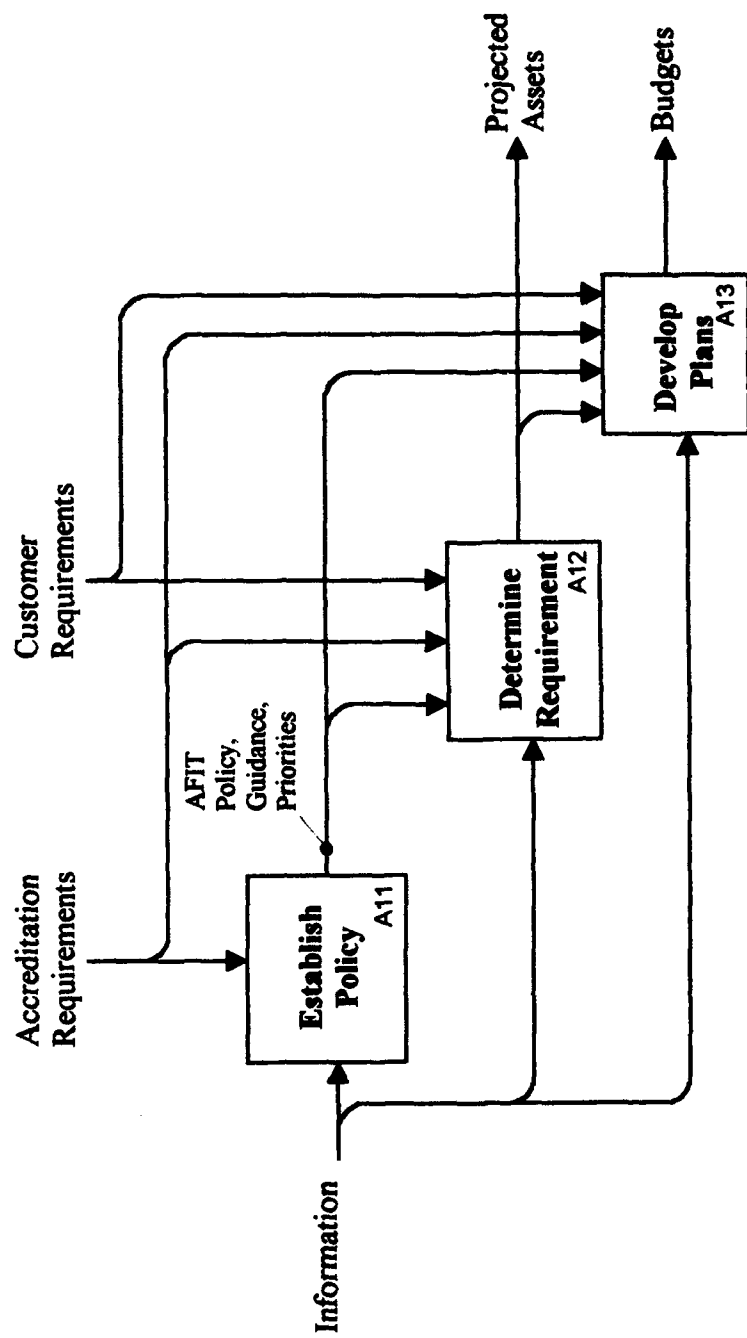
Decomposition Diagram, Figure 4-6, discussed later in the chapter.

The primary difference between the context diagram and the A0 decomposition diagram is that at the A0 level, relationships between the processes begin to appear. For example, the two outputs of the Establish Direction process appear in the Acquire Assets process as a control and an input. Another example is found in the A3 Decomposition Diagram, in which the output called Enhanced Faculty becomes a mechanism for the Train Students and Educate Students processes.

Thorough analysis of these types of relationships becomes critical as a business process improvement project develops. The interdependencies between processes result in impacts on other processes when one is changed to make it more efficient. This consideration is one of the key elements discussed in Chapter II that makes business process improvement unique: the cross-functional perspective.

The next three sections of the chapter present the decomposition of the three processes contained in the A0 Decomposition Diagram.

The A1 Decomposition Diagram. In Figure 4-4, the Establish Direction process is decomposed into three subprocesses: Establish Policy, Determine Requirements, and Develop Plans. As activities performed in the parent process, these three processes are still part of the



NODE: A1

TITLE: Establish Direction

Figure 4-4 AFIT A1 Decomposition Diagram

strategic level functions, and therefore still align closely to the DoD Model.

The Establish Policy process assesses the impact of the three controls discussed previously to formulate AFIT's policies, provide senior level guidance, and set AFIT's priorities. It is during this process that AFIT's senior leadership develops the goals and objectives needed to support the strategic plan. They also determine in this process what products and services AFIT will provide for its customers and in what form. For example, they may decide that PCE courses in general are a critical product that must be provided to meet Customer Requirements. They may also decide, based on Customer Requirements, that a large number of distance learning PCE courses must be provided. Once these types of decisions are made, represented in the diagram as AFIT Policy, Guidance, and Priorities, they become a control for the next two processes.

The Determine Requirements process assesses the capabilities of AFIT in the context of the priorities set in the Establish Policy process. It includes identifying what assets are needed to accomplish the objectives and provide the capabilities determined by the senior leadership. The output of this process, Projected Assets, becomes a control for the Develop Plans process, and a final output of the overall Establish Direction process. It also becomes an

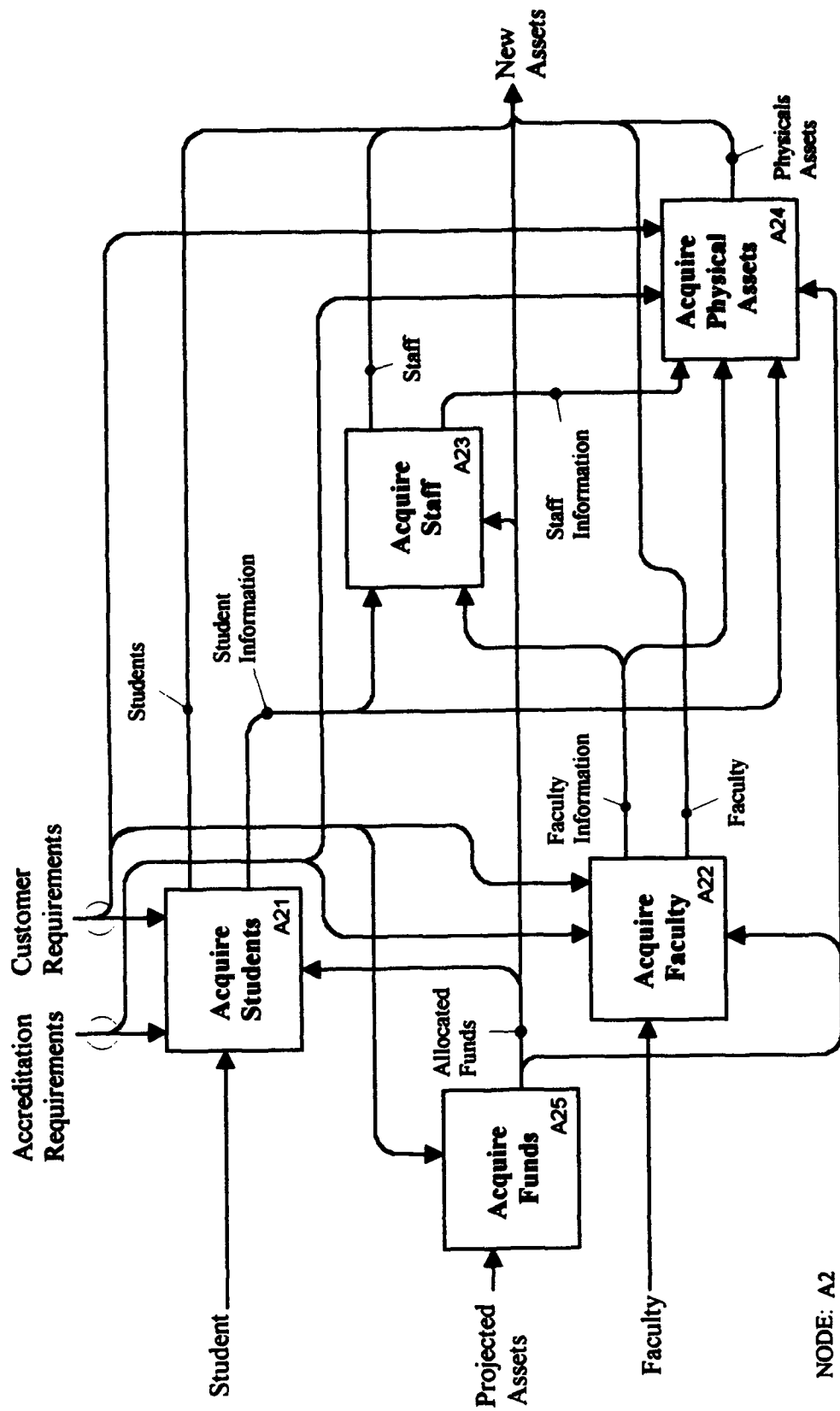
input into the next process, Acquire Assets, because it defines what must be acquired.

The Develop Plans process integrates AFIT's Projected Assets with AFIT Policy, Guidance, and Priorities, and the higher level controls already discussed. It then translates these requirements into executable plans, the primary output of which is AFIT's operating budget and its capital budget, collectively called Budgets. As stated earlier, Budgets become a control for the Acquire Assets and Provide Capabilities processes.

The A2 Decomposition Diagram. In Figure 4-5, the Acquire Assets process is decomposed into five subprocesses, each concerned with acquiring a specific type of asset: funds, students, faculty, staff, and physical assets. As shown in the diagram, these subprocesses contain a number of interdependencies.

The Acquire Funds process begins the Acquire Assets subprocesses since, as stated earlier, very little can be accomplished without the funding being obtained first. Controlled by Customer Requirements and Budgets, the Acquire Funds process includes all activities associated with obtaining operating and capital funds from all sources. The output, Allocated Funds, becomes a mechanism to accomplish the acquisition of the other types of assets needed.

The Acquire Students process encompasses all of the activities required to enroll a student in AFIT or an AFIT



NODE: A2

TITLE: Acquire Assets

Figure 4-5 AFIT A2 Decomposition Diagram

sponsored program. These activities include the distribution of available quotas, evaluating and selecting applicants, and all administrative support activities necessary to enable the selected applicants to assume their role as AFIT students. This includes such activities as in-processing, setting up computer accounts and access privileges, assigning academic advisors, and so forth. Upon completion of the Acquire Students process, the students themselves become part of AFIT's assets from a process perspective, while the Information about the students becomes an input to the Acquire Staff and Acquire Physical Assets processes.

The Acquire Faculty process is very similar to the Acquire Students process, other than determining quota distribution and assigning an academic advisor. Additionally, it includes the recruitment and hiring of faculty members. Its outputs are used in the same way as discussed above for the students.

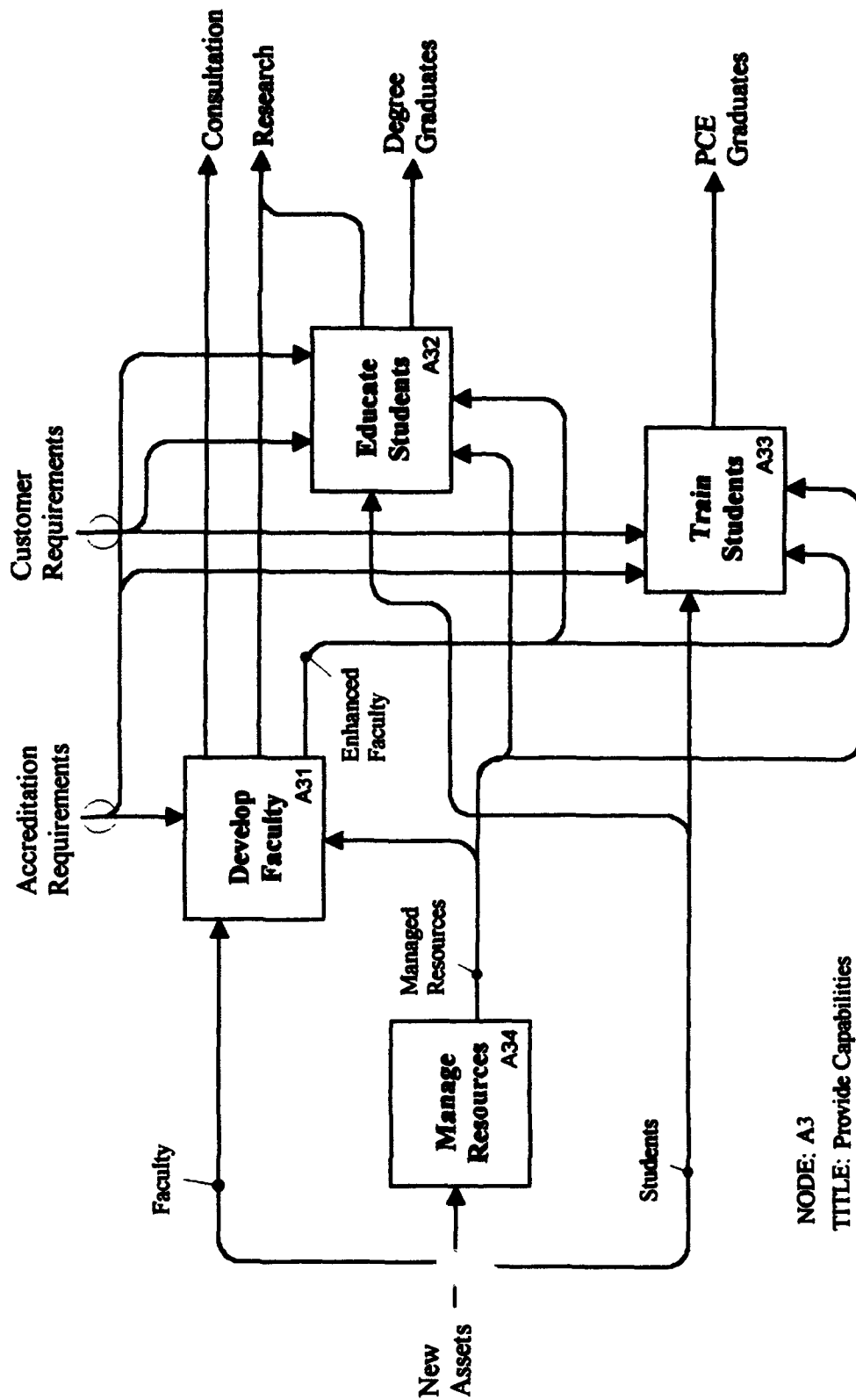
The Acquire Staff process involves the activities required to determine the size and composition of the staff needed to support the students and faculty. It also includes the hiring and assignment of staff members, subject to the budget constraints developed in the Establish Direction process. The Information about the staff becomes an input to the Acquire Physical Assets process, while the

staff members become part of New Assets, just as in the first two processes.

The Acquire Physical Assets process includes the acquisition of AFIT's facilities, equipment, and information systems. The size, number, and composition of these physical assets are determined by a number of various inputs and controls, as shown in the diagram. The output, Physical Assets, combines with the other outputs to form the final output of the Acquire Assets process, New Assets. This output represents everything AFIT needs to provide the capabilities it has determined it will provide.

The A3 Decomposition Diagram. In Figure 4-6, the Provide Capabilities process is decomposed into four subprocesses: Manage Resources, Develop Faculty, Educate Students, and Train Students. This process and its subprocesses represent AFIT's operational management level, i.e. AFIT's day-to-day activities, and thus are generally more specific than those of the higher level processes.

The Manage Resources process encompasses the activities associated with the day-to-day management and oversight of AFIT's staff, funds, and physical assets. Examples of these types of activities includes the administrative functions of the Orderly Room, the execution of the AFIT Financial Plan, and the maintenance of AFIT's facilities, equipment and information systems. The output of this process, Managed



NODE: A3

TITLE: Provide Capabilities

Figure 4-6 AFIT A3 Decomposition Diagram



Resources, becomes a mechanism through which the other three processes are completed.

The Develop Faculty process includes the activities performed by the AFIT faculty members, other than those directly related to interacting with the students. Develop Faculty activities include attending professional development courses, publishing technical articles and books, developing program curricula and course materials, performing consultations, and conducting research. It also includes activities related to the benefit of the faculty such as academic promotion processes, evaluations, mentorship programs, and administrative support. One output of this process, Enhanced Faculty, becomes the mechanism that transforms students into graduates. The other two, Research and Consultation, are two of AFIT's products provided for its customers.

The Educate Students process includes all activities directly related to AFIT graduate students. This includes faculty driven activities such as teaching courses, counseling, evaluating progress, advising thesis efforts, and assisting the students in joint research projects. The Educate Students process also includes the administrative support provided such as class scheduling, thesis publication, and records updating. The outputs of Research and Degree Graduates are also part of AFIT's final products.

The Train Students process is similar to the types of activities included in the Educate Students process, relating to AFIT PCE students instead of graduate students. The primary differences between the two processes are the thesis related activities. The PCE Graduate output is the final product AFIT provides for its customers.

### Summary

This chapter presented the results of the researchers' efforts to identify AFIT's products and services and its critical success factors in meeting its goals. A discussion of each factor was provided based on interviews with members of AFIT's senior staff.

The remainder of the chapter presented the AFIT Enterprise Model, beginning with the context diagram which depicts AFIT's strategic mission as it relates to the DoD mission. The AFIT context diagram was broken down into three critical strategic processes: Establish Direction, Determine Requirements, and Develop Plans. Each of these critical processes was then decomposed into lower level processes. The activities comprising each process at each level were discussed, along with their corresponding ICOMs and the relationships between the processes. The significance of analyzing the relationships as a component of business process improvement was also discussed.

These three levels of IDEF0 diagrams collectively comprise the AFIT Enterprise Model developed in this research. These efforts represent the first attempt to document AFIT's critical business processes, which is the first step in initiating a business process improvement project for the Air Force Institute of Technology.

## V. Conclusions and Recommendations

### Overview

The current DoD environment demands efficiency and flexibility in its business processes and supporting information systems. This chapter discusses what AFIT can do to prepare itself to meet DoD's challenges. It begins with a discussion of the researchers' conclusions regarding the use of BPI as a tool to accomplish this preparation. The remainder of the chapter is devoted to a discussion of recommendations for further research in this area.

### Preparing AFIT for Fee-for-Service

Declining defense dollars necessitate major changes in the way DoD organizations operate. DBOF and its related fee-for-service concept is one DoD-mandated method for many DoD support activities to generate the savings required to meet the funding reductions. To operate AFIT successfully under fee-for-service, its decision makers need to have information about the cost of, and understand the underlying business processes of, providing its services.

The BPI approach to improving business processes requires a great deal of up front effort, with little or no short-term payoff. However, as a long-term management tool, it offers a tremendous amount of potential payoff in future benefits. By documenting the costs of individual processes

and the relationships between the processes through the use of process modeling, information needed for critical fee-for-service related decisions will be readily available for AFIT's decision makers. In a rapidly changing environment such as DoD and AFIT currently face, the difference between having this type of information available and having to compile it separately for each case could mean the difference between AFIT being able to influence the outcome of a higher headquarters decision and simply having to accept it after the fact.

The AFIT Enterprise Model developed in this research is the first step in understanding AFIT's business processes, identifying and documenting its critical processes from a macro level. Although this first model was not developed to a level of sufficient detail to provide any immediate benefit, it provides the foundation for a fully developed business process model for AFIT. Once the model is complete, it can be used to identify areas for improvement and to measure the performance improvements generated by making changes to the process. It can also be used to determine AFIT's information requirements, which will facilitate the integrated information system needed to compete in a fee-for-service environment.

### Recommendations for Further Research

To provide AFIT's decision makers with the information they need, the AFIT Enterprise Model must be further developed. There are two approaches that can be taken: 1) complete development of a full AS-IS model, to include activity based costing, and 2) development of a single process as a proof-of-concept project to determine the benefit of further development.

A Complete AFIT AS-IS Model. The first approach offers the greatest benefit over the long term, but, as in the case of this research, little or no short-term payoff. It would involve the full decomposition of each of the four processes shown in the A3 Decomposition Diagram (Figure 4-6): Manage Resources, Develop Faculty, Educate Students, and Train Students.

Non-value added activities identified during this phase would be recommended for elimination, and activity based costing applied to the remaining activities. Opportunities for improvement would then be targeted based on the highest cost activities, and TO-BE models developed for those selected. This approach would require the use of a functional team for each of the four processes.

A Proof-of-Concept Model. The second approach is a scaled down version of the first. As such, it would provide a lesser benefit since it would involve only a single process. However, it does offer the benefit of short term

results because of its limited scope. It would use the same basic approach as outlined above, but on a smaller scale. Upon completion, analysis of the model could be used to determine if the investment in a fully developed BPI project for AFIT is warranted.

The DoD Universities Information Management BPI Project. Another recommendation for further research is to analyze the findings of this project with respect to its applicability to AFIT. This approach could capitalize on the efforts already expended in this project and shape future BPI efforts within AFIT. Not only could the analysis be used to AFIT's direct benefit, but it could also be used to determine how AFIT could contribute to the project, providing AFIT with a role in this highly visible DoD effort.

#### A Final Recommendation

Regardless of the approach taken, the evidence clearly shows a need for AFIT to pursue a better understanding of its business processes. Unless the investment in this area is made now, the probability is high that AFIT will find itself at a disadvantage in its ability to respond quickly to rapidly changing requirements in the future. Making this investment now as opposed to later appears to be of significance to AFIT's future successes and should be

pursued in whatever form AFIT's senior leadership deems appropriate.

### Summary

This chapter presented the researcher's conclusions on the value of a process model to AFIT's decision makers as a means of preparing to implement fee-for-service. It discussed the additional efforts needed to complete the AFIT Enterprise Model for use as a management tool and explained the up-front cost of using the BPI approach to process improvement.

The chapter also presented three recommendations for further research concerning AFIT's investment in BPI. To complete the AFIT Model as a single project would offer the most value, but only in the long term. A proof-of-concept project involving a single process would offer a short-term benefit of limited application which could be used to determine the value of a full BPI effort. The final recommendation for further research was to analyze the DoD Universities Information Management BPI Project to determine its applicability to AFIT.

Finally, the chapter emphasized the need for AFIT to pursue further development of a tool to help understand the relationships between its business processes to help AFIT's decision makers respond quickly to a rapidly changing environment.



## Appendix A: IDEF Glossary

(I)=Input, (C)=Control, (O)=Output, (M)=Mechanism, (A)=Activity

Accreditation Requirements:(C) The educational and administrative prerequisites necessary for AFIT to remain an accredited institution.

Acquire Assets: (A) The process of obtaining people, funds, equipment, facilities, and related items necessary to accomplish the mission.

Acquire Faculty:(A) The process of obtaining new faculty members, to include recruitment, selection, and hiring.

Acquire Funds: (A) The process of obtaining money for a specific purpose.

Acquire Physical Assets: (A) The process of obtaining physical assets, to include buildings, facilities, equipment, and information systems.

Acquire Staff: (A) The process of obtaining the staff members needed to support AFIT faculty and student requirements.

Acquire Students: (A) The process of obtaining new students to include the quota distribution, evaluation of applicants, selection, and enrollment.

AFIT Guidance:(C/O) The advice and direction provided by AFIT senior leadership to the faculty and staff.

AFIT Policy: (C/O) A guiding principle or procedure directed by AFIT senior leadership, designed to influence and determine decisions, actions, and other matters.

AFIT Priorities:(C/O) An authoritative rating determined by AFIT senior leadership that establishes a precedence.

Allocated Funds: (O/I) Funds set aside for a specific purpose.

Budget: (O/C) A plan of action that determines the financial resources needed for a particular purpose within a specific time period, to include day-to-day activities and capital investments.

Consultation:(O) The result of an act or procedure where advice is given or views are exchanged.

Customer Requirements:(C) The graduate programs and specific PCE courses required by AFIT customers, to include the number of students required for each.

Degree Graduate:(O) A student who received an academic degree from AFIT or an AFIT sponsored degree from a civilian institution.

Determine Requirements: (A) The process of deciding what assets are needed for AFIT to perform its mission.

Develop Faculty:(A) The formal and informal learning processes used to allow faculty members to become more proficient in their field of study, to include performing consultation and conducting research.

Develop Plans: (A) The process of clarifying a formulation or program for the accomplishment or attainment of specific goals or purposes.

Educate Students: (A) The process of providing students with knowledge through formal schooling with the intent of stimulating or developing mental or moral growth.

Enhanced Faculty:(O/M) A faculty member whose capabilities have been enhanced through formal and informal learning processes.

Establish Direction: (A) The process of developing a course of action toward a particular end or goal.

Establish Policy: (A) The process of determining a guiding principle or procedure designed to influence and determine decisions, actions, and other matters.

Faculty Candidate:(I) A person who has applied for a faculty position.

Faculty Information:(O/I) Data relating to AFIT faculty members, to include total number, academic rank, and position, used to determine staff and physical assets requirements.

Faculty:(O/I) All personnel, military and civilian excluding full-time students, who teach at least one course.

Funds:(M) Money required to support the AFIT mission.

HHQ Guidance:(C) The advice and direction provided by higher headquarters, to include the Department of Defense, Air Force, Air Education and Training Command, and Air University.

HHQ Policy:(C) A guiding principle or procedure directed by higher headquarters, designed to influence and determine decisions, actions, and other matters.

HHQ Priorities:(C) An authoritative rating determined by higher headquarters that establishes a precedence.

Information:(I) Knowledge derived from study, experience, investigation, or instruction.

Information Systems:(M) Equipment, facilities, and supporting infrastructure that are used to produce or transfer data.

Manage Resources:(A) The process of performing administrative activities required to maintain management control over funds, staff, and physical assets.

Managed Resources:(O) The funds, staff, and physical assets which have been managed as defined above.

New Assets: (O/I) People or items obtained to perform the mission, to include students, faculty, staff, funds, and physical assets.

Personnel: (M) Faculty and staff members employed by or assigned to AFIT.

PCE Graduate:(O) A person who has successfully completed an AFIT Professional Continuing Education (PCE) course.

Physical Assets:(O) Material items necessary for AFIT to operate, to include buildings, facilities, equipment, and information systems.

Projected Assets:(O/C/I) Assets determined by AFIT senior leadership to be necessary to provide selected capabilities.

Provide Capabilities: (A) The process of performing the day-to-day activities required to produce the services determined by AFIT senior leadership.

Research:(O) The result of scholarly or scientific investigation or inquiry, usually DoD related.

Staff Information:(O/I) Data relating to staff members to include total number and positions held, used to determine physical assets requirements.

Staff:(O/M) All personnel, military and civilian excluding full-time students, who do not teach courses.

Student Applicant: (I) Someone who has applied to attend AFIT or an AFIT sponsored course or program at a civilian institution.

Student Information:(O/I) Data relating to AFIT students to include total number, school, and status, used to determine staff and physical assets requirements.

Student:(O/I) Someone who attends AFIT or an AFIT sponsored course or program at a civilian institution.

Train Students: (A) The process of making students (more) proficient in a specific area of study through specialized instruction and practice.

## Appendix B: Selected Diagrams from the DoD Enterprise Model

USED AT	AUTHOR : DDI	DATE : 10/07/92	X	WORKING	READER	DATE	CONTEXT
	PROJECT : ENTERPRISE	REV : 01/21/93		DRAFT			
	COMPANY : DOD, DIRECTOR DEFENSE INFORMATION			RECOMMENDED			
	NOTES : X Z 3 4 5 6 7 8 9 10			PUBLICATION			

Executive & Congressional Authorities

World Situation

Federal Regulations

PROVIDE FOR THE  
COMMON DEFENSE

1

0012

Level of Response

Defense Policy & Guidance

Budgets

Separated Assets

Civilian Population

Industrial Resources

Allied Assets

Threat Forces

Allied/Coalition Forces

International & Domestic Community

1 VIEWPOINT: Secretary of Defense and civilian and military leaders authorized to carry out missions in support of the National Security and Military Strategies.

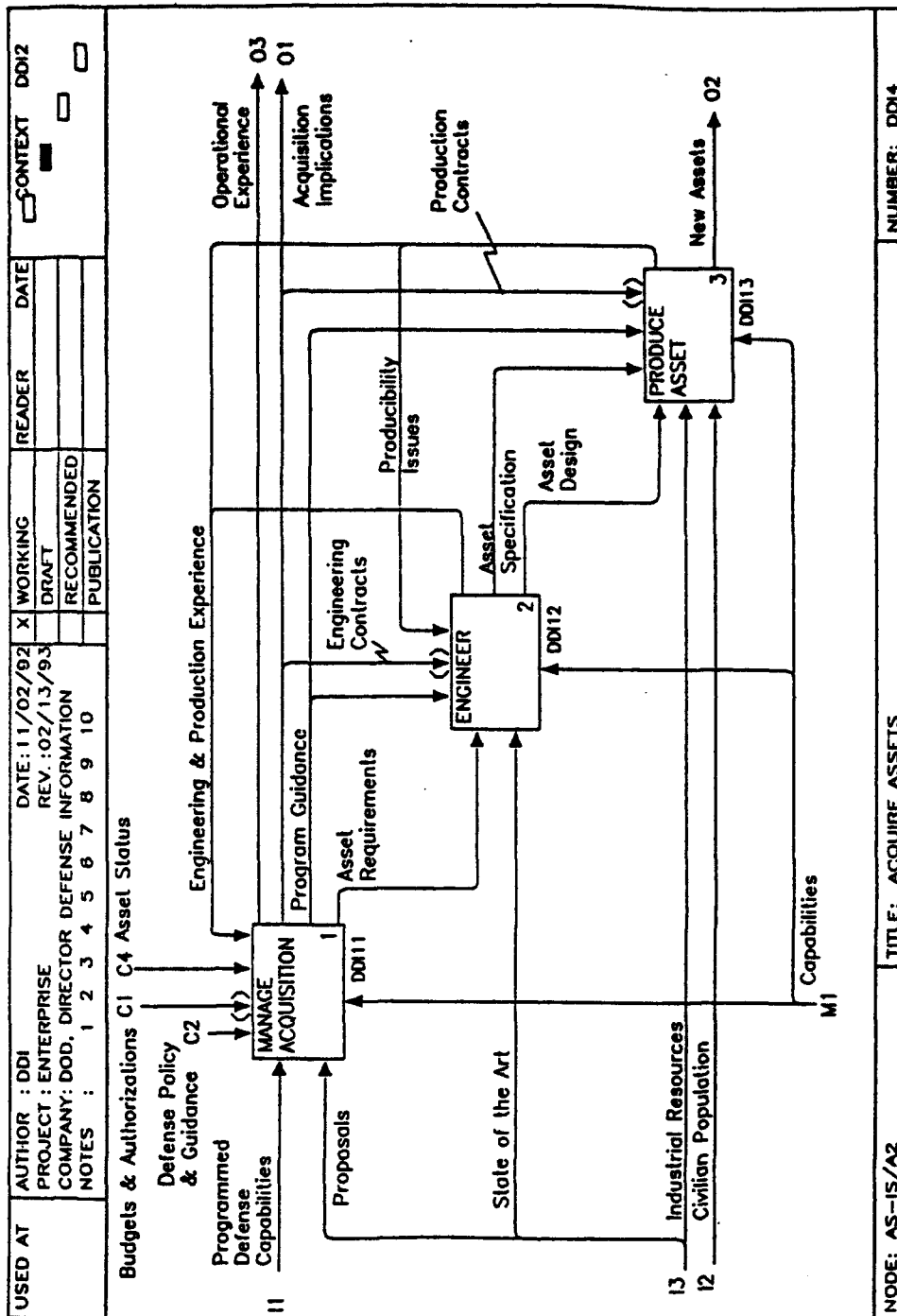
2 PURPOSE: To develop the standard frame of reference for identifying improvement opportunities, anticipating the impact of management, process, and technology improvements, and making useful changes.

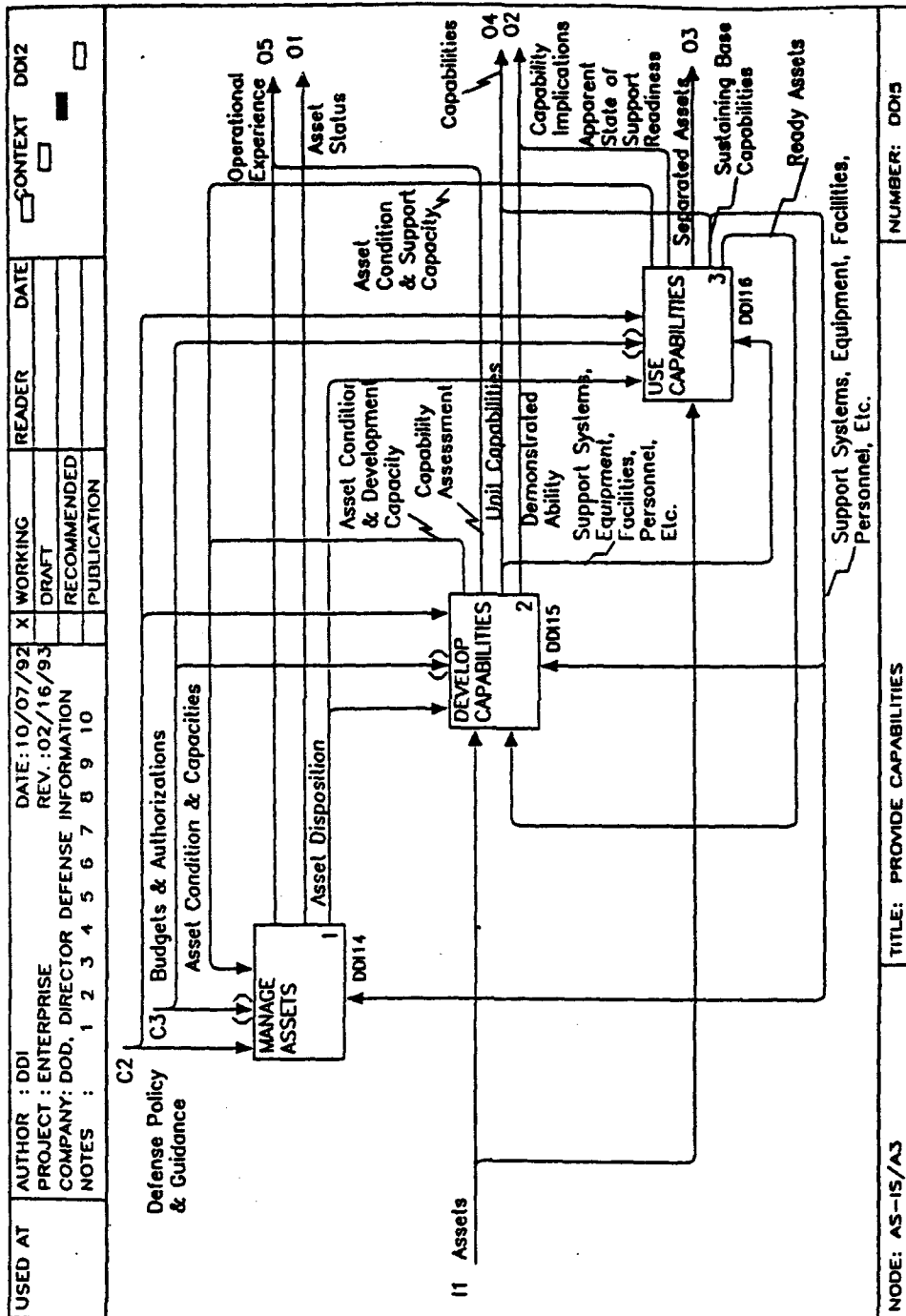
NODE: AS-IS/A-A-0	TITLE: PROVIDE FOR THE COMMON DEFENSE
	NUMBER: DD1











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### Vita

First Lieutenant Jerry A Cole was born 8 September 1964 in San Diego, California. He graduated from Newell Providence Community High School, Newell Iowa in 1982. Lieutenant Cole enlisted in the Air Force in January 1985. He started his military career as an Tactical Aircraft Maintenance Specialist for the 47th Organizational Maintenance Squadron at Laughlin AFB. While enlisted Lieutenant Cole attended night school earning credits toward a Bachelor's degree. In July 1988 Lieutenant Cole separated from the Air Force to accept a pilot allocation from the ROTC department at East Texas State University. In his senior year, Lieutenant Cole was chosen as one of the university's "Top Ten Seniors" for 1990, and to be a member in the Alpha Chi Honor Society. Lieutenant Cole graduated from East Texas State in 1990 with a Bachelor's of Business Administration in Human Resource Management. Upon graduation in May 1990, Lieutenant Cole was chosen as a Distinguished Graduate and awarded a Regular commission. After a nine month wait, Lieutenant Cole attended Undergraduate Pilot Training at Vance AFB in February 1991. After receiving a "banked" aircraft, Lieutenant Cole entered the School of Systems and Logistics, Air Force Institute of Technology in May 1992.

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### Vita

Major Patricia Cruz began her military career in 1977 by enlisting in the Air Force Reserve as an administrative specialist. In 1980, she received a Bachelor of Science in Business Administration with highest honors from the University of Southern Mississippi. Shortly after graduation, Major Cruz was selected to attend Officer Training School, where she earned the distinction of distinguished graduate. After commissioning, she was assigned to Cannon AFB NM as a Deputy Accounting and Finance Officer. Her subsequent assignments included Hellenikon AB GR, Myrtle Beach AFB SC, and MacDill AFB FL. In 1989, Major Cruz joined the Palace Dollar Comptroller Officer Assignments Team at the AF Military Personnel Center, Randolph AFB TX. She entered the AFIT Graduate Information Resource Management Program in May 1992 and will be reassigned to the Information Management staff of the Air Education and Training Command Headquarters at Randolph AFB TX upon graduation. Major Cruz' military decorations include the AF Meritorious Service Medal with one oak leaf cluster and the AF Commendation Medal with two oak leaf clusters. She is married and the mother of two sons.

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 1993		3. REPORT TYPE AND DATES COVERED Master's Thesis
4. TITLE AND SUBTITLE INFORMATION REQUIREMENTS FOR THE AIR FORCE INSTITUTE OF TECHNOLOGY UNDER A FEE-FOR-SERVICE CONCEPT				5. FUNDING NUMBERS
6. AUTHOR(S) Jerry A. Cole, 1st Lt, USAF Patricia C. Cruz, Major, USAF				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Institute of Technology, Wright-Patterson AFB OH 45433-6583				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GIR/SC/93D-3
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)  None				10. SPONSORING / MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION AVAILABILITY STATEMENT  Approved for public release; distribution unlimited				12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words)  Due to the current shift in national defense strategy, the DoD is going to have to perform new roles and missions with major reductions in resources. One of the major initiatives committed to achieving savings is Corporate Information Management, a broad program designed to help the DoD operate more efficiently by application of successful private sector business practices and better application of information technology. To meet the challenge of operating in a business-like environment AFIT must be able to maximize its competitiveness to provide customers with the quality and types of services they desire. To accomplish this task, information technology can be of benefit in identifying exactly how AFIT's business processes can be improved and in assessing the impact of future DoD policy decisions on the Institute.  This study developed a top level business process model for AFIT's information requirements under a fee-for-service concept. Once a comprehensive business process model is completed for AFIT, it will provide a framework on which AFIT decision-makers can assess the impacts of changes in DoD and Air Force policy on the Institute. The model will also provide a foundation for the development of an integrated information system capable of meeting AFIT's future information requirements.				
14. SUBJECT TERMS Business Process Improvement, Fee-For-Service, Defense Business Operation Fund, Corporate Information Management, Air Force Institute of Technology, IDEF				15. NUMBER OF PAGES 88
				16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified		18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified		19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified
				20. LIMITATION OF ABSTRACT UL

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The purpose of this questionnaire is to determine the potential for current and future applications of AFIT thesis research. Please return completed questionnaires to: DEPARTMENT OF THE AIR FORCE, AIR FORCE INSTITUTE OF TECHNOLOGY/LAC, 2950 P STREET, WRIGHT PATTERSON AFB OH 45433-7765

1. Did this research contribute to a current research project?

a. Yes

b. No

2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?

a. Yes

b. No

3. The benefits of AFIT research can often be expressed by the equivalent value that your agency received by virtue of AFIT performing the research. Please estimate what this research would have cost in terms of manpower and/or dollars if it had been accomplished under contract or if it had been done in-house.

Man Years \_\_\_\_\_ \$ \_\_\_\_\_

4. Often it is not possible to attach equivalent dollar values to research, although the results of the research may, in fact, be important. Whether or not you were able to establish an equivalent value for this research (3, above) what is your estimate of its significance?

a. Highly  
Significant

b. Significant

c. Slightly  
Significant

d. Of No  
Significance

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